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Man vs. The Machine: "Giant Brains," Computer Automation and Fears of Technological Unemployment, 1945-1965

The opening scene of the 1957 film *Desk Set* begins with a bird's eye view of an IBM 702 computer (the most advanced business computer at the time) installation set on a Mondrian-esque designer floor. As the camera zooms in on the gun-metal gray line printer, it suddenly comes to life, spewing forth the introductory credits. Over the next hour and a half, movie-goers follow the romantic exploits of Bunny Watson (Katherine Hepburn), the head of a TV network research department, and Richard Sumner (Spencer Tracy), the "methods engineer" hired to modernize her operations by installing a new computer. Sumner's activities are treated with suspicion and hostility by Bunny and her two female co-workers who fear that they are going to lose their jobs once the computer is operational. Their suspicions are confirmed when the computer merrily issues pink termination slips to the women in their next paycheck. Something is terribly amiss, though; the computer fires not only the research room staff, but also the head of the network – and Sumner, who isn't even on the payroll. The crowning moment of the film (as far as this paper is concerned) occurs when Bunny accuses Sumner of using the computer to replace workers – a point which he vehemently denies. Instead, he says, the computer was installed to free her time for research. In fact, he says, the company was even considering hiring a few more girls for the department.

That *Desk Set* reflected contemporary fears of technological unemployment within the office has been noted by other historians.[1] But for historians of information technology, a deeper reading of *Desk Set* can provide guideposts for understanding the complex context in which computers first entered the office. Whereas early scholars of computer history laid the groundwork for the field by focusing on the technological innovations or the leading people within the field, more recent historians have begun to emphasize the ways in which computers were applied and even how computers became imbedded in Cold War political discourse.[2] Some of the most recent scholarship has pushed the field into new areas, examining the emergence of professional groups within corporate America that developed alongside computer technology.[3] In so doing, these authors have demonstrated that the power of information technologies to reshape social relations demands the critical attention of historians.

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[1] Amy Sue Bix, *Inventing Ourselves out of Jobs? America's Debate over Technological Unemployment, 1929-1981* (Baltimore: The Johns Hopkins University Press, 2000).

[2] For some of the earlier work on the people, industry, and technology, see John Backus, "The History of Fortran I, II, and Iii," in *History of Programming Languages* (Association for Computer Machinery, 1981), Charles J. Bashe et al., *Ibm's Early Computers* (Cambridge: The MIT Press, 1986), Claude Baum, *The System Builders: The Story of SDC* (Santa Monica: System Development Corporation, 1981), Martin Campbell-Kelly and William Aspray, *Computer: A History of the Information Machine, The Sloan Technology Series* (New York: Basic Books, 1996), Paul E. Ceruzzi, *A History of Modern Computing* (Cambridge: The MIT Press, 1999), James Chposky and Ted Leonsis, *Blue Magic: The People, Power, and Politics Behind the IBM Personal Computer* (New York: Oxford University Press, 1988), I. Bernard Cohen, *Howard Aiken: Protrait of a Computer Pioneer* (Cambridge: The MIT Press, 1999), Kenneth Flamm, *Creating the Computer: Government, Industry, and High Technology* (Washington, D.C.: The Brookings Institution, 1988), Kenneth Flamm, *Targeting the Computer: Government Support and International Competition* (Washington, D.C.: The Brookings Institution, 1987). Some of the more recent scholarship on the applications of information technology, see James W. Cortada, *Before the Computer: IBM, NCR, Burroughs, and Remington Rand and the Industry the Created, 1865-1956*, ed. David Hounshell, *Princeton Studies in Business and Technology* (Princeton: Princeton University Press, 1993), Paul N. Edwards, *The Closed World: Computers and the Politics of Discourse in Cold War America* (Cambridge: The MIT Press, 1996), Arthur L. Norberg and Judy E. O'Neill, *Transforming Computer Technology: Information Processing for the Pentagon, 1962-1986*, ed. Merritt Roe Smith, *Johns Hopkins Studies in the History of Technology* (Baltimore: The Johns Hopkins University Press, 1996), JoAnne Yates, "Co-Evolution of Information-Processing Technology and Use: Interaction between the Life Insurance and Tabulating Industries," *Business History Review* 68, no. 1 (1993), Shoshana Zuboff, *In the Age of the Smart Machine: The Future of Work and Power* (New York: Basic Books, 1988).

[3] Nathan Ensmenger and William Aspray, "Software as Labor Process," (2000), Thomas Haigh, "Inventing Information Systems: The Systems Men and the Computer, 1950-1968," *Business History Review* 75, no. Spring (2001).

In this paper, I hope to add another dimension to this unfolding story by exploring the broader social, intellectual, and professional context in which computers were introduced into business from 1951-1963 – a context presented in *Desk Set*. Fear of the "giant brain," hostility toward methods engineers, and suspicions that the computer would replace workers were not the products of Hollywood writers looking for plot devices. Instead, these were elements drawn from everyday American life; elements that must have resonated with the audience. In particular, I want to introduce another line of analysis in the debate as to why computers failed to achieve the rapid gains in white-collar productivity promised by equipment vendors, computer consultants, and data processing personnel during the first decade of application.[4] Traditional explanations have cited, among other things, the technological limitations of computer systems and the unforeseen difficulty in analyzing business processes and then programming the computer to carry them out. In addition, most industry observers stressed that failure ultimately lay in the unwillingness of executive management to provide data processing managers with a mandate to push through the organizational changes required to utilize computers fully.[5] This last point was especially troublesome to data processing personnel who were attempting to position themselves as information experts, replete with

[4] Although I am only focusing on the first decade of administrative computing, there is still considerable debate as to why computers *still* have not delivered the productivity gains that were promised. See for example, Thomas K. Landauer, *The Trouble with Computers: Usefulness, Usability, and Productivity* (Cambridge: The MIT Press, 1995)..

[5] For contemporary criticisms of the failings of data processing to achieve its potential, see: Allan S. Beale, "EDP as Viewed from the Front Office," *Journal of Data Management* 3, no. 11 (1965).,James A. Campise, "Management by Crisis Or: How to Fail in Data Processing Management without Really Trying," *Data Management* 5, no. 4 (1967), L.R. Jr. Fiock, "Seven Deadly Dangers in EDP," *Harvard Business Review* 40, no. 3, May-June (1962), Robert J Koch, "Manage to Avoid a Scapegoat Computer," *Journal of Data Management* 3, no. 1 (1965), Philip H. Thurston, "Who Should Control Information Systems?," *Harvard Business Review* 40, no. 6 (1962).,Richard G. Canning, *Installing Electronic Data Processing Systems* (New York: John Wiley & Sons, Inc., 1957), John Diebold, "ADP -- the Still-Sleeping Giant," *Harvard Business Review* 42, no. 5 (1964).. If anything, these claims become even more numerous by the late 1960s and continue through the 1980s.

professional credentials and, hopefully, an elevated position within the corporate management hierarchy. While these are all salient points, I focus instead on the popular perceptions people held about computers throughout the 1950s and early 1960s and how these meshed with, and reinforced, a widespread concern over technological unemployment. The fear among white-collar workers that computers would take their jobs often created a climate of hostility towards proponents of automation and provided a basis for resistance to their efforts. By the late 1950s, management consultants and the business equipment industry recognized that white-collar intransigence was limiting the effective deployment of information technology. In response, they launched a concerted effort to change the popular perception of computers as "giant brains," and "job destroyers."

The "Giant Brain"

Understanding how the public perceived computers in the 1950s is important for historians trying to map the ways in which computers shaped social relations at work. Initially, the extent of computerization was dependent, in no small part, on elements such as employee resistance. Long before computers were available for business purposes, Americans were inundated with stories about the capabilities of these new "mechanical brains." Through numerous magazine articles, newspaper columns, company press releases, and television programs, the public was informed of the great strides made in calculating equipment. Commonly referred to as "giant brains" by reporters, Americans constantly heard stories about calculating machines that were capable of doing work heretofore the province of the human mind. And unlike machinery that augmented human physical powers, computers represented efforts to extend mechanization to certain

functions of the human brain. Even more alarming, these "electronic brains" could do their work faster than a human, tirelessly, and without errors.

Although stories about advances in calculating equipment related to top-secret military research had circulated shortly after the end of World War II, the unveiling of IBM's Selective Sequence Electronic Calculator in January 1948 marked a watershed for computers in the public consciousness. At the dedication ceremonies attended by dozens of eminent scientists, businessmen, government and military leaders, IBM officials lauded the SSEC's dramatically improved speed over previous machines – some 250 times faster than the IBM Automatic Sequence Calculator (Harvard Mark I) built just four years earlier. By far the most advanced machine of its time, the SSEC was the first electronic calculator to run on software, meaning it could be applied to different problems simply by feeding it new instructions.[6] As a demonstration of the computer's capabilities, its chief architect, Dr. W.J. Eckert, formerly a professor of Astronomy at Columbia University and the first scientist hired to staff IBM's Watson Scientific Computing Laboratory, programmed the SSEC to calculate the position of the moon at six hour intervals for the proceeding and forthcoming century. In his dedication speech, Dr. Eckert boasted that the mathematical equation needed to describe each moon position required more than 300 large printed pages merely to state; yet the computer produced a complete solution to this equation every seven minutes. Just preparing the punched cards containing the equation took thirty-eight days work by a mathematician. Further, it was estimated that to do even one year's calculations by hand would take a scientists

[6] This is generally referred to as the "stored program concept." Charles J. Bashe, "The SSEC in Historical Perspective," *IEEE Annals of the History of Computing* 4, no. 4 (1982).

approximately 4,800 hours. The SSEC promised to do the whole job somewhere in the neighborhood of 17,000 hours.[7]

However, it wasn't just the speed that separated the SSEC from previous computers; it was also its presentation. Installed at the IBM offices on Fifty-seventh Street in Manhattan, it incorporated a sleek, modern design with brushed metallic walls, tall columns, recessed lighting, and marble steps. The machine itself was 120 feet long, filled three walls, and was encased behind glass panes. As much of the computer was hidden from view under the raised floor and drop ceiling, some visitors reported being slightly unnerved by the experience of walking *into* this "giant brain."[8] More importantly, the installation was visible from the street, and hundreds of passer-bys could watch the neon indicators that flashed whenever the computer was working. For years, this was the image conjured in people's minds when they thought about computers; an image reinforced by Hollywood's adoption of it in science fiction movies.[9] The SSEC set a precedent for IBM, as successively more advanced computer "showpiece" systems were installed at the highly visible 57th street location where they could gawked at by pedestrians.

In the weeks following the dedication, radio and television stations did special reports on the SSEC, and numerous dignitaries, school children, and businessmen visited the installation. Despite the admonition by Thomas Watson, Sr. in his dedication speech that there was "no such thing" as a "mechanical brain," the popular press nationwide

[7] John O'Neil, "SSEC Dedication Speech," (IBM Corporate Archives, August 25, 1947).
[8] "It Pays to Think," *Investor's Reader*, February 28, 1948.
[9] Thomas J. Watson, Jr. and Peter Petre, *Father, Son & Co.: My Life at IBM and Beyond* (New York: Bantam Books, 1990).

latched onto this designation in its coverage of the new computer.[10] Headlines such as "Huge New Electronic Brain Begins Two-Year Moon Task," "New Electric Brain Cuts Years in Doing Complex Mathematics," and "Electric Brain to Save Years of Time" were common.[11] Common, too, in these accounts were references to its vast "memory," improved efficiency, and ability to "solve problems that would take scientists years or a lifetime to work out."[12]

Yet this technological marvel was not without its detractors. In the wake of the SSEC debut, articles appeared in newspapers critical of efforts to create ever-more-powerful computers. Began one editorial entitled "Men Versus Robots," "There's something alarming about the way scientists apply themselves relentlessly to devising better and better electronic models of the human brain." While impressed by the machine's "speed, …accuracy, …phenomenal memory, [and] its tirelessness," the author says these are quite disconcerting, too. "Is such a contraption fit to live with," he asks. "Any woman who is married to a human wizard will have her doubts about the inanimate variety. Being incomparably more competent, it must be proportionally more offensive to the more normal, or small-gauge brain." He even warned that the computer might lead to a widespread existential crisis, "There are enough things in the world already that contribute to inferiority complexes without having to vie with these monsters….Dr. Frankenstein found out long ago it was easier to create a monster than control it afterwards." True, they might not go berserk and "take over the planet…. but they are a

[10] Thomas J. Sr. Watson, "SSEC Dedication Address," (IBM Corporate Archives, January 27, 1948).
[11] "Huge New Electronic Brain Begins Two-Year Moon Task," *Winston Salem Journal*, January 28, 1948; "Electric Brain Goes to Work on Problem of Moon," *Cedar Rapids Gazette*, January 28, 1948; "Electric Brain to Save Years of Time," *Seattle Times*, January 28, 1948; "New Electric Brain Cuts Years in Doing Complex Mathematics," *Toledo Times*, January 28, 1948.
[12] "Bet it does Homework, too," *Augusta, ME Journal*, January 28, 1948.

menace in another way. They will make the average man's brain look pretty second-rate. And even if it is, the average man does not enjoy being told so."[13]

A *New York Herald Tribune* editorial had an equally stark assessment, stating simply "the machine is becoming too arrogant. The new mechanical brain, put into operation this week by the International Business Machines Corporation, is not satisfied merely to solve complicated problems – it solves them with an ease that can be nothing but humiliating to the men who tend it."[14] The tone of these articles suggests that there was a general concern that the machine mind already surpassed the human mind in certain cognitive tasks.

For other commentators, these new "mechanical brains" added another level of uncertainty to an already uncertain world. Said one widely reprinted editorial:

> None of the brilliant men who helped create this robot (SSEC) could begin to finish that calculating job in one lifetime. Yet together, they have built a machine that easily disposes of problems beyond the power of human solution. Brilliant men also devised the atomic bomb. Now a means of saving the human race from the product of its own ingenuity seems beyond the power of man's mind. If only the scientists could put wires and tubes together into a superhuman brain that could solve that problem.[15]

In another instance, Samuel Grafton, a left-leaning syndicated columnist also expressed a general unease emerging from the SSEC project. Finding IBM's "gadget" "vaguely alarming," Grafton mused "it seems too much like a symbol of our time, geared for producing the most precise and beautifully-tooled answers to questions which nobody knows quite how to formulate. Don't look now, but is that machine simpering? It seems to wear a smirk a room wide, challenging our age to ask it something." Placing the computer within the broader context of the Cold War, Grafton suggests that the "brain"

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[13] Editorial, "Men Versus Robots," *Hartford Connecticut Courant*, February 3 1948.
[14] Editorial, "Monster and Man," *Amsterdam, N.Y. Recorder*, January 30 1948.
[15] Editorial, "A Stumper for the Super-Robot," *Lancaster, Ohio Eagle Gazette*, February 3 1948.

might be better applied than simply figuring out astronomical tables, since "the precise position of the moon is not the anxiety which keeps the world awake these nights, and tossing."[16]

The "Giant Brain" and Technological Unemployment

For the next decade, the popular perception of the computer as a "giant brain" became the organizing trope around which equipment manufacturers, their customers, and the public tried to arrive at a consensual understanding of this emerging technology.[17] The persistence of this metaphor, and the concomitant unease that computers engendered, derived, in part, from the fact that the range of activities to which computers could be applied seemed nearly inexhaustible. One early article in *Scientific American* investigated the potential for computers to automate an oil refinery, stating flatly:

> Since a machine can be instructed to perform any set of logical operations, however complicated, it can be programmed at the outset to react in emergencies precisely as would a well-instructed human operator—and it can react at least a thousand times faster. Further, the machine can be given a set of criteria for appraising the relative success of its various acts, and can be enabled to alter its own program of instructions in the light of experience on the job…The same machine can regulate the performance of the factory and keep the necessary accounting records.[18]

To the American public, it seemed that no application was beyond the computer. In rapid succession, the "giant brains" tackled with varying degrees of success: natural language translation, English to Braille conversion, social science research, crafting names for new pharmaceuticals, and the most hallowed of human intellectual pursuits of all – chess playing.[19] Even Winston Churchill, long considered to be one of the most erudite men in

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[16] Samuel Grafton, "I'd Rather Be Right," *Charleston, W.VA Gazette*, January 31 1948.
[17] This concept of interpretive flexibility is explored in Wiebe E. Bijker, Thomas P. Hughes, and Trevor F. Pinch, eds., *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology* (Cambridge: The MIT Press, 1987).
[18] Louis N. Ridenour, "The Role of the Computer," *Scientific American* 187, no. 3 (1952).
[19] University of California: Radio-Television Administration, "IBM Braille Printer," ed. Science Editor (1959. Courtesy IBM Corporate Archives), Alex Bernstein and Michael de V. Roberts, "Computer V.

the world, was no match for an IBM 704 installed at MIT, as the computer was able to "remember" approximately 60,000 English words. Sadly, Churchill had the ability to use only 50,000 words.[20]

As computers moved out of the scientific arena and were applied increasingly to administrative tasks within large companies, the advertised ability of "giant brains" to do almost any task dovetailed with a broader intellectual and public debate on technological unemployment to create a persistent climate of fear and uncertainty among many office workers.[21] Although the introduction of office machinery was not new – indeed, office technologies like the typewriter, telephone, vertical filing, and punched-card systems all contributed to the reorganization, and often the routinization of clerical tasks – the potential of the computer to do these jobs with little human intervention *was new*.[22] For the first time, management ranks faced the prospect that machines could replace *them*.

Norbert Wiener, mathematician and one of the founding theorists of cybernetics, addressed this very point and its potential consequences in his hugely popular 1950 book *The Human Uses of Human Beings: Cybernetics and Society*. Accepting the mechanization of the human brain, and equating it with automation, Wiener noted that

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Chess-Player," *Scientific American*, no. 6 (1958), Chas. Pfizer & Co. Press Release, Inc., "Electronic Word-Maker Writes Drug Lexicon," (Brooklyn, NY: January 25, 1956. Courtesy IBM Corporate Archives), Louisiana State University Press Release, "IBM Installation Use by Graduate Students at L.S.U.," *Business Machines* 32, no. 49 (1950).

[20] MIT Office of Public Relations, "Press Release," (Cambridge, MA: 1958. Courtesy IBM Corporate Archives).

[21] Bix, *Inventing Ourselves out of Jobs? America's Debate over Technological Unemployment, 1929-1981*. Bix does address the issue of computers and unemployment briefly in her chapter "The Displacement Question in Postwar America (pp. 236-79), but only focuses on two examples – *Desk Set* and Kurt Vonnegut's *Player Piano* when looking at the cultural component of this fear.

[22] James R. Beniger, *The Control Revolution: Technological and Economic Origins of the Information Society* (Cambridge, Massachusetts: Harvard University Press, 1986), Cortada, *Before the Computer: IBM, NCR, Burroughs, and Remington Rand and the Industry the Created, 1865-1956*, Sharon Hartman Strom, *Beyond the Typewriter: Gender, Class, and the Origins of Modern Office Work, 1900-1930* (Urbana: University of Illinois Press, 1992), JoAnne Yates, *Control through Communication: The Rise of System in American Management* (Baltimore: The Johns Hopkins University Press, 1989), Zuboff, *In the Age of the Smart Machine: The Future of Work and Power*.

the machine made no distinction between manual labor and white-collar labor. Furthermore, he had no doubts that as computers became more powerful, executives would apply them, with profound ramifications. "The automatic machine," he wrote, " is the precise economic equivalent of slave labor. Any labor which competes with slave labor must accept the economic conditions of slave labor. It is perfectly clear that this will produce an unemployment situation, in comparison with which the present recession and even the depression of the thirties will seem a pleasant joke."[23]

Although the term 'automation' was not Wiener's (it was coined by Delmar S. Harder in the _____), it was quickly adopted to describe these new processes and technologies affecting both blue and white-collar work.[24] Unlike the earlier introduction of machines that had routinized and standardized industrial production, computers added a new dimension to work organization. "Automation is far more than an extension of present-day mechanical gadgetry," began one article in *Business Week*, "Mechanization means the replacement of human power with mechanical power, humanly controlled. Automation, going a step further, eliminates the human control."[25] Should it live up to its potential, automation promised a new kind of corporate structure. No longer would management preside over large organizations with thousands of employees. Instead, the article suggested, managers "will in the future be operating great mechanical organizations using fewer and fewer people." The advantages were clear: "When you

[23] Norbert Wiener, *The Human Uses of Human Beings: Cybernetics and Society* (New York: Houghton Mifflin Company, 1967).
[24] There were distinctions made between different types of automation – "Detroit," "feed-back control process," and "computer process." Whereas "Detroit automation" involved "integrating machines with one another to give a continuous flow of production materials," computer automation was simply the use of data processing equipment to "record, tabulate, and analyze data." Melvin Lloyd Edwards, "The Effect of Automation on Accounting Jobs" (Ph.D. Dissertation, University of Oklahoma, 1959).
[25] "Coming in the Years Ahead, Bigger Plants -- Running with Many Fewer People," *Business Week* (1953).

subtract much of the human element from the production, a host of organizational problems are solved. Not business problems, but the personnel problems that complicate a business decision."[26]

Clearly, for management, computers offered a solution to the seemingly intractable problem of labor relations that plagued post-war America. Indeed, some writers blamed the activities of organized labor for management's heightened interest in computers. As Louis Ridenour succinctly observed in *Fortune*, "The present activities of some labor organizations seem calculated to encourage this trend [toward automation]. Rising wages put a premium on high productivity per worker, and thus on fewer workers. Any act of capricious irresponsibility or malicious obstructionism on the part of labor unions…put a premium on as complete an elimination of the human worker as possible."[27]

Ridenour proved to be quite prescient for as automation spread during the 1950s, unions recognized that it presented them with both an opportunity and a threat. By the mid-1950s, unions had incorporated the labor replacing potential of computers in their efforts to organize white-collar workers. Commenting on the effects of office automation which was already well under way, Teamsters Union president James Hoffa proclaimed, "More and more the work of the white collar employee is being downgraded. The machine is invading the office, and as a result office work is production these days." To union officials, the computer's ability to replace clerical workers initially, and middle-management potentially, meant that white-collar workers needed union protection more

[26] Ibid.
[27] Louis N. Ridenour, "Mechanical Brains," *Fortune*, no. May (1949).

than ever. "They are beginning to realize that you can't eat or wear 'prestige'," Hoffa noted wryly, "and it does not pay the rent or help meet installment payments."[28]

Other sources, both from the management perspective and the popular press, seemed to corroborate union claims that computers would produce serious dislocation, stagnant career paths, or outright job loss. "Human beings are going to be displaced in staggering numbers by electronic equipment," wrote the editors of *The Controller*, a journal for corporate finance men. "Productivity will soar as white-collar employment and purchasing power drops…. The effect of electronic equipment on our economic life is one of the same magnitude as the effect of the H-bomb on our military strategy."[29] Even the staid *Harvard Business Review* did not shy away from predicting that computers would have profound implications for white-collar employment. In a widely quoted article, "Management in the 1980s," the authors predicted that information technology would rearrange middle-management positions, with the effect that "*certain classes* of middle-management jobs [would move] downward in status and compensation (because they will require less autonomy and skill) while other classes move upward into the top-management group."[30] In a section entitled "revolutionary effects," the authors warned, "major resistances should be expected in the process of converting relatively autonomous and unprogrammed middle-management jobs to highly routinized programs." Just as middle management had to look for techniques to overcome unions and industrial worker's resistance to change, "this time it will be the top executive who is directly concerned, and the problems of resistance to change will occur among those middle

[28] Arnold E. Keller, "Automation Arrives and -- James Hoffa Eyes the Office Worker," *Management and Business Automation* preview issue, no. October (1958).
[29] Editorial, "Electronics in the Office," *The Controller* 23, no. 3 (1955).
[30] Harold J. Leavitt and Thomas L. Whisler, "Management in the 1980s," *Harvard Business Review* 36, no. 6 (1958).

managers who are programmed out of their autonomy, perhaps out of their current status in the company, and possibly even out of their jobs."[31]

If the claims of technological unemployment circulating in the press were not enough to generate an enhanced level of anxiety among office workers and management, then the activities of their employers more than made up for it. Changes to office procedures often began years before a computer was actually acquired. As part of conducting a feasibility study, methods engineers (like Richard Sumner) made careful studies of the work processes within departments targeted for automation. The anxiety felt by Bunny Watson and her co-workers mirrored the experiences of thousands of clerks and middle managers who found themselves explaining the nuances of their jobs to so-called "efficiency experts." One veteran of this experience reported:

> They set up an organizational chart, indicating how the division was operated and its relation to other sections. Then, they did a time-and-motion study of everyone, but paid special attention to the departments to be affected by the machine. They listed the number of times an individual left his chair in the process of doing his work. Every time you moved your arm, someone wrote it down on paper.

According to this source, the workers did not know exactly how all this would affect them, and there was much conjecture. Although management assured staff members that jobs would not be changed in any way, "we knew better. We figured that all this measuring had something to do with the million-dollar baby they were talking about."[32]

Invariably, accounting departments were some of the first to be scrutinized because operations such as payroll were very repetitive, had few exceptions that would stump a computer, and in many cases were already being processed on punched card equipment. For the people conducting the feasibility study (and who often had much to

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[31] Ibid.
[32] Ida Russakoff Hoos, *Automation in the Office* (Washington, D.C.: Public Affairs Press, 1961).

gain should their recommendation be adopted), the accounting department became the perfect beachhead within the company. On the one hand, because the processes were well understood, transferring these operations to a computer would be fairly straightforward. Thus, it would be possible to get the system up and running relatively quickly, with the goal of producing a success story on which to base other automation efforts. Second, and more importantly to executives, automating the clerical operations of accounting meant that the cost of acquiring a computer could be justified by the savings arising from reduced labor costs.[33] For many employees within the affected departments, it was hard to interpret the recommendations of the feasibility study in terms other than their jobs were in jeopardy.

Management promises that no one would lose their job must have rung hollow, especially when the computer finally arrived. Into the late 1950s, it was standard practice for companies to issue press releases to local newspapers announcing the new acquisition. These press releases generally followed a standard format. First, they invariably referred to the computer as either an "electronic," "mechanical," or in some cases a "magic" brain, inadvertently emphasizing the same metaphor that generated unease among many people. Next, the announcement indicated what tasks the brain would do, and more importantly, the speed with which this job would be done especially in comparison to previous methods. So the Electrolux company could brag that their "magic brain" "…ran off the payroll in eighteen minutes…include[ing] all the calculations necessary to figure each employee's hourly rate, his half time rate, overtime

[33] For an excellent discussion of the feasibility study and the justifications presented to executives for acquiring a computer, see Thomas Haigh, "The Chromium-Plated Tabulator: Buying, Selling, and Institutionalizing an Electronic Revolution, 1954-1958," *forthcoming article in IEE Annals of the History of Computing* (2001), Frank Wallace, *Appraising the Economics of Electronic Computers* (New York: Controllership Foundation, Inc., 1956).

pay, gross pay, old age security insurance, etc."[34] Likewise, the Chrysler Corporation's "giant electronic brain" spent sixteen hours a day "thinking" about automobile parts needed by distributors, while Monsanto's "brain" could pump out a cost report "which might take an accountant two hours in only thirty seconds." As Monsanto's St. Louis division handled 1,200 cost reports a month, the man-hours saved were clear.[35] Once again, despite management assurances that nobody would lose their job, the emphasis on cost and time savings over manual (read human) methods in the publicity did little to assuage the fears of office workers that their jobs were on the block.[36] Combined with the results of internal feasibility studies that stressed cost savings due to reduced clerical staff managers and their staffs had reason to be concerned.

Even the publicity shots of computer installations added to this fear. Model installations were almost like modern art pieces, and IBM even hired famed architect Eliot Noyes to design their computer product line.[37] The streamlined appearance of the equipment was enhanced by the small number of staff depicted working on it. Rarely did promotional literature show more than three people working in a large computer installation, subtly implying that this staff was doing all the work previously done by some unnamed department. Although in reality it took many more staff to operate a data processing department, for employees working in soon-to-be-automated offices, it appeared that their presence was unnecessary.

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[34] "Magic Brain Pride of Tabulating Department," August 1 1950. Courtesy IBM Corporate Archives.
[35] Chrysler Corporation Press Release, "Chrysler Installs Giant Electronic Brain at Mopar," (Detroit, MI: November 21, 1955. Courtesy IBM Corporate Archives), Monsanto Chemical Company Press Release, (St. Louis, MO: February 25, 1955. Courtesy IBM Corporate Archives).
[36] Management consultants strongly recommended that companies acquiring computers conduct a round of "educational" seminars to ease fears of job loss among their employees. See Canning, *Installing Electronic Data Processing Systems*.
[37] Thomas J. Jr. Watson, "Good Design Is Good Business," *Think* IBM Design Files (1966, Courtesy IBM Corporate Archives).

Business Machine Industry Fights Back

By the late 1950s, it was abundantly clear that computers had failed to deliver the rapid gains in office productivity promised by salesmen and systems specialists. As one 1958 *Business Week* special report on computers proclaimed:

> Just four years ago, at Louisville, KY, a new industrial revolution started. It began with fanfare and great expectations – with the installation of the first large-scale electronic computer planned exclusively for business use.
> Since then, it has become perhaps a most perplexing and disgruntled – but inevitable – revolution…. Results have fallen far short of the rosy dreams in which they came wrapped.[38]

Management consultants and the business machine industry struggled to identify where the dream had been diverted. On the one hand, the systems themselves were still relatively limited meaning that more advanced applications geared towards delivering a nebulous product called "management information" were still unfeasible. Equally daunting was the unforeseen difficulty in mapping the interrelated functions of corporate administrative and then translating these to the computer. "Giant brains" worked well for scientific problems because the data tended to be well known and from a limited domain. However business practices were not nearly so tidy; for every operation that could be routinized, there were a dozen exceptions that required human judgment. Next, there was the issue of a lack of support among executives for the data processing function. To be truly effective, data processing managers claimed, their authority had to cross departmental lines; only then could the DP department deliver timely and accurate management information to executives.[39]

Finally, like a dirty little family secret, there was the issue of internal resistance from management and staff to automation efforts. Management literature alluded to

[38] "Computers," *Business Week*, June 21 1958.
[39] see note #5

employee resistance only in vaguest of terms, but the frequency with which this issue appears and the efforts companies made to combat it imply that this was a much bigger issue than has been made previously in historical scholarship concerning computers. Whereas pundits expressed certainty that with time technological limitations could be overcome, new methods of work analysis would improve, and executives would eventually grant the needed organizational mandate to the data processing department, the issue of worker resistance had to be addressed immediately. As one consultant wrote, "the costs after installing an automatic computer can be as high or even higher than they were before putting it in if people do not get on the team, if they insist on maintaining their little empires or building them still bigger and stronger."[40]

At the heart of the resistance was the fear among employees that computerization would lead unemployment. Office workers reasoned that even if the computer initially performed only routine tasks, given the seemingly limitless capabilities of the "giant brains" eventually their use would be expanded. In a round table discussion of the effects of business automation in the 1960s sponsored by the Management and Business Automation magazine, the moderator admitted that even middle management people were beginning to wonder if there was any future for them, "what with the machines being played up as tomorrow's decision makers."[41] His fears were strengthened by a survey conducted by the University of Michigan indicating that middle management was

[40] Ned Chapin, *An Introduction to Automatic Computers* (Princeton: D. Van Nostrand Company, Inc., 1955).
[41] Round Table Discussion, "MBA Round Table Discusses... Effects of Business Automation in the Sixties, Part I," *Management and Business Automation* 5, no. 1 (1961).

actually opposing the installation or purchase of automated systems for fear that they would remove the need for middle management decisions.[42]

To combat these fears, the business machine industry press and management pursued a multivariate approach. First and foremost, they tried to dispel the "myth of the electronic brain." Chastising the popular press for perpetuating this metaphor, the editors of *Management and Business Automation* wrote:

> The "electronic brain" has proven to be a product of 20th century mythology. But, myths die hard. The appalling ignorance of computer functions evidenced by editors of the daily press, combined with their affinity for science fiction headlines, have been chief factors in keeping a confused image of the electronic computer in the public mind. Constant use of such terms as "electronic brain" and "thinking machine" have only served to promote the computer as a modern "Frankenstein's Monster" designed to replace man's mind and his livelihood.[43]

In a longer article in the same issue, William Christian expounded on this point, stating: "The 'electronic brain' is a myth, not a machine. But the myth, unfortunately, rivals the machine in popularity. The paradox arises from the continuing efforts of journalists, cartoonists and science fiction writers to give 'personality' to the inanimate digital computer. This constant misrepresentation has confused the public to the point where they now look upon the computer as some kind of electronic monster that will eventually take over, not only their jobs, but their thinking ability as well."[44] He singled out Norbert Wiener, accusing him of encouraging this myth. Taking issue with Wiener's earlier writings and a speech he delivered in front of the American Association for the Advancement of Science on the effects of automation on work, Christian notes that following the speech "scare headlines about 'electronic brains' taking over man's

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[42] Round Table Discussion, "MBA Round Table Discusses... Effects of Business Automation in the Sixties, Part II," *Management and Business Automation* 5, no. 2 (1961).
[43] Editorial, "Little Myth Makers," *Management and Business Automation* 3, no. 6 (1960).
[44] William Christian, "Myth of the "Electronic Brain"," *Management and Business Automation* 3, no. 6 (1960).

thinking appeared the next day, with no apparent attempt from Dr. Wiener to avert or modify them. Surely no one man has unintentionally done more to inspire and foster the myth of the 'electronic brain.'"[45]

A year later, the campaign to discredit the "giant brain" perception continued. This time, however, some of the blame was ascribed to the computer industry itself. Defending automation and claiming that it actually created jobs, Arnold Keller noted the irony involved in having to combat the "brain" metaphor. "The reason for such a booming industry being pictured as a 'job destroyer' in public minds can be traced right back to the industry's own doorstep – or at least to its public relations departments. The tendency to label computers as 'electronic brains' or 'magic brains,' and the coupling of these terms with stories about the clerical replacement possibilities of the machines has created a 'monster' image in the public mind, one on which union leaders and other 'welfare minded' individuals have been quick to capitalize."[46]

That press releases and feasibility studies might add to employee fears of job loss seems obvious, yet it also points to a difficulty inherent in purchasing computer systems in the early years. In order to justify the acquisition of an expensive computer –a purchase sometimes equated with the development of a new plant or product in management literature – there needed to be a solid and defensible monetary benefit.[47] With no hard numbers to draw upon, members of the feasibility study downplayed the "intangible" benefits of automation (i.e. improved management information, etc.) and went with the justification that appealed to executives – cost savings accruing from fewer

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[45] Ibid.
[46] Arnold E. Keller, "Automation -- the Job Maker," *Management and Business Automation* 5, no. 4 (1961).
[47] B. Conway, J. Gibbons, and E.E. Watts, *Business Experience with Electronic Computers: A Synthesis of What Has Been Learned from Electronic Data Processing Installations, Controllers Institute Research Foundation, Inc.* (New York: Price Waterhouse & Co., 1959).

workers. Once again, management consultants suggested a change in tactics. Rather than emphasize labor displacement, they suggested trying to remove the "intangible" label from the subtler benefits of automation.[48] "There is general agreement," said one editorial, "that the greatest potential for significant savings with EDP does not involve clerical replacement. Far greater are savings in valuable and measurable time and space: invoices mailed within hours of the shipment; statements mailed on closing day; profit and loss statements on a daily basis; reductions in inventory…. For some reason systems people seem content to label these realities as 'intangibles' rather than make the effort to establish a specific price tag on each item. True, it is not always an easy task to establish these values, but without them, it is impossible to evaluate a systems proposal."[49]

In addition to the twin initiatives of combating the "giant brain" metaphor and de-emphasizing the labor saving potential of computers, the business equipment industry launched a full-scale defense of automation efforts in general. In testimony before Congress, in the popular press, and in management journals, industry leaders insisted that while automation caused some job displacement, overall it led to more jobs, more creative jobs, and a higher standard of living.[50] The editors of *Management and Business Automation* offered one such example, stating, "just as the automobile diminished the ranks of the blacksmiths, and electricity ended the need for lamplighters… the blacksmiths became auto builders, and the lamplighters become power linemen."[51] A supervisor at a key punch installation offered his own testimony to this debate, suggesting

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[48] Discussion, "MBA Round Table Discusses... Effects of Business Automation in the Sixties, Part II."
[49] Editorial, "Away with "Intangibles"," *Management and Business Automation* 5, no. 2 (1961).
[50] This was the standard argument in support of automation efforts in the past. As Bix illustrates convincingly, business leaders would dust it off when necessary. See Bix, *Inventing Ourselves out of Jobs? America's Debate over Technological Unemployment, 1929-1981*.
[51] Editorial, "Automation and the Unemployment Myth," *Management and Business Automation* 1, no. 5 (1959).

that the work of his particular group of key-punchers was not quite as routine as one might assume: "They have to know what to punch on each card," he said "and the combinations are always different."[52]

Adding urgency to their defense of automation was the recession that began in the mid 1950s and carried over into the early 1960s. In the shadow of rising unemployment that hit everyone hard -- even white-collar professionals – industry supporters maintained that automation was not to blame for the recession.[53] They insisted in testimony before the House Committee on Education and Labor, which was investigating the impact of automation on unemployment, that in offices with computers installed, very few people lost their jobs. In particular, they cited a Bureau of Labor Statistics study of twenty offices in private industry that had installed a large computer. Of the 2,800 employees affected by computers, only nine persons had been laid off. In fact, continued the editors, in seventeen of these offices, clerical employment actually increased by seven percent.[54]

While it was true that current employees often were not fired when a computer was acquired, at ground zero the reality was a bit different. In trying to assess the impact on the staff to be automated, management consultants identified three different groups of employees. The largest class was the relatively unskilled workers doing repetitive clerical work such as filing, sorting, and recording, and whose understanding of the overall business was minimal. The second group consisted of personnel with more experience and seniority. These people still did relatively routine jobs where little original thinking was required beyond recognizing exceptions to usual routines that had to be passed along to higher authorities. Quite often, members of this group were older

[52] Hoos, *Automation in the Office*.
[53] "Now, White Collars Get Frayed," *Business Week*, May 31 1958.
[54] Editorial, "Panic on the New Frontier," *Management and Business Automation* 5, no. 3 (1961).

and had been with the company for years. The third group was composed of better skilled workers doing supervisory work.[55]

Long before installing the new computer, management laid the groundwork by reducing personnel within the departments to be automated. Since turnover was high in the most routine clerical jobs, and often done by women, consultants suggested that given enough time, normal attrition plus the "cupid and the stork" would take care of excess staff.[56] Should the installation be delayed, the company hired temporary workers to fill vacant positions in the months leading up to the computer's arrival. The second group, those in repetitive supervisory positions were harder to deal with because they had to be relocated within the company. Described by one consultant as "somewhat inflexible," these folks were difficult to move because there were few job openings at comparable levels for people with their qualifications.[57] When the decision came to install a new system however, company employees in the affected areas were given the opportunity to take examinations to determine whether they were well-suited to staff the new data processing department. Usually, this included a battery of tests geared towards measuring mechanical aptitude "reasoning qualities," and logical thought processes.[58] In addition, employees in consideration for work in the DP department were evaluated for their ability to work under pressure. For those employees who passed the exams, the best

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[55] Wesley S. Bagby, "The Human Side of Electronics," in *Installing Electronic Data Processing Systems*, ed. Richard G. Canning (New York: John Wiley & Sons, Inc., 1957).
[56] Hoos, *Automation in the Office*.
[57] Bagby, "The Human Side of Electronics."
[58] Deborah L. Blumer, "A Program for Selecting Data Processing Personnel," *Management and Business Automation* 2, no. 6 (1959). This article contained sample tests from an "expert" that required the test taker to imagine how four oddly shaped items might fit together to form a two-dimensional unit. As one astute reader pointed out in the letters column of the next issue, there were errors in the exam, as two of the puzzles couldn't possibly fit together to create the shapes offered as a solution. See also Conway, Gibbons, and Watts, *Business Experience with Electronic Computers: A Synthesis of What Has Been Learned from Electronic Data Processing Installations*.

were culled to work in the new data processing department. For others, though, like the "inflexible" mid-level supervisory-sort, their options were limited. Usually, the company tried to offer a lateral transfer with the same pay to another department that had not yet been automated. It was common however, for this transfer to require moving to a different city, which meant that although workers were not fired, should they desire to keep their job they had to leave their friends, schools, churches, and broader communities.

With these tactics – hiring temporary workers to do clerical work, no marriage policies, and transfers to other departments or divisions – it was possible to mask the rate at which computers were replacing office workers. More importantly, the one statistic that did not come up was the number of people *not hired* to staff offices once the computer was in place. While the editors of *Business Automation* were quick to cite the Labor Department study suggesting that clerical employment had increased by seven percent in seventeen of the companies studied, they failed to quote the very next line which read: "The increase, however, was less than the fifteen percent rise reported for clerical and kindred workers in the nation as a whole."[59] And even though companies offered some training programs to ease the shift to automated processes, these programs were aimed at the more educated employees rather than those of the middle tier. As for these other folks, retraining was fraught with knotty problems. As management guru John Diebold testified before Congress, "we don't know what people should be retrained

[59] Howard Couglin, "Letters," *Management and Business Automation* 6, no. 5 (1961).

for; we don't know what the educational needs are in terms of the impact of automation in 1965 or 1970."[60]

Conclusion

Whether management's efforts to combat the "giant brain" image were successful is unclear. More likely, the perception faded on its own accord, as computers became permanent fixtures in corporate America. Likewise, the debate as to whether office automation led to white-collar unemployment receded as the American economy expanded rapidly enough to provide high employment rates throughout the 1960s. However, it is equally likely that perception trailed reality, as cartoonists continued to churn out panels addressing the issue of computers and technological unemployment.

Beginning in the late 1940s, the metaphor of the "giant brain" was for many people a way to mediate their understanding of what a computer was and what it could do. The popular press, computer manufacturers, scientists, and the public relations departments of companies installing computers latched onto this designation and inadvertently gave credence to the fears that this amazing machine could replace human workers. In addition, feasibility studies, press releases, and computer advertisements that stressed (or implied) computers would pay for themselves by replacing workers meshed with a broader intellectual and public debate on the merits of automation. The overall result was to create an environment of hostility, uncertainty, and in some cases overt resistance to office automation. As one industry observer reported, the greatest resistance to automation in his company had been encountered among the tabulating personnel:

> They just do not want to accept the computer because they know it represents a threat to their jobs. Their machines and they are going to be eliminated, and they wittingly or

[60] Arnold E. Keller, "Government Outlines Attack on Automation," *Management and Business Automation* 6, no. 5 (1961).

> unwittingly do everything in their power to throw a monkey wrench into the works. At least, the men in the computer room suspect the tab guys of obstructionist tactics in preparing the cards.[61]

Not directly address in this paper, but an important part of this story, was the struggle within middle and upper management as to who would control the data processing function. At the same time that data processing personnel were attempting to establish control over corporate computing as a distinct power center within business, challengers emerged among accountants and controllers who lobbied hard to maintain data processing activities within their departments. For both the "long hairs" of the DP department and the older, more conservative controllers, computer technology was seen as the key to elevating their status and position to the executive level.

By exploring the general unease felt by many people towards computer technology and the efforts to allay these concerns, I hope to paint a more complex picture of how computers were introduced within companies. I contend that management and staff perceptions of the computer were important in shaping its application. While it is true that technological considerations and the inherent difficulty in analyzing business procedures limited the effectiveness of computers, equally important was the resistance of workers to automation. It was the office staff and their managers that proved to be an unexpectedly resilient "reverse salient'" in the application of computer technology to business.[62] The widespread fear of replacement or displacement among white-collar workers, together with a power struggle over who would control the computer, stymied efforts to deploy information technology as broadly or as effectively as had been hoped.

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[61] Hoos, *Automation in the Office*.
[62] For a discussion of the idea of "reverse salients" see Thomas P. Hughes, *Networks of Power: Electrification in Western Society, 1880-1930* (Baltimore: Johns Hopkins University Press, 1983).

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